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(54) **A method of producing absorbent articles provided with fastener means that include locking elements**

(57) The present invention relates to a method of manufacturing absorbent articles provided with fastener means that include locking elements. According to the invention the method comprises the step of delivering a first web of material (4) to an absorbent article manufacturing machine; separating discrete pieces of material (7) from the first web (4); applying the discrete material pieces (7) to a second web of material (5), for instance a web of material which is to form an absorbent article casing sheet; and thereafter forming locking elements in the regions of the discrete material pieces (7).

EP 0 934 739 A2

Description

BACKGROUND

[0001] The present invention relates to a method of manufacturing absorbent article fastener means. The fastener means are used preferably to fasten or close an absorbent article, such as a diaper, an incontinence guard or like article. The fastener means is effective in fulfilling the desired function of the absorbent articles with regard to sealing of said articles at their leg openings and waist part, and also in ensuring a good fit. The fastener means enables the article to be opened and re-closed repeatedly.

TECHNICAL BACKGROUND

[0002] Many different kinds of absorbent article fastener means are available commercially. One example of such fastener means is found described in U.S. 5,236,429, wherewith the absorbent article is fastened with the aid of a number of fastener tabs which are fastened within a particular tape-receiving area designed to enable the fastener tabs to be loosened from and refastened in said area repeatedly. This enables the fit of the absorbent article on the wearer to be adjusted and also enables the article to be inspected repeatedly with regard to its soiled state. Also available commercially are different products in which the fastener means have the form of so-called touch-and-close fasteners, e.g. Velcro® tape, which are used in a similar manner to the aforesaid fastener tabs. Also known to the art are fastener means which use conventional buttons, press studs and like devices. U.S. 5,269,776 describes a diaper which includes fastener means comprised of discrete pieces of material that are provided with a multiple of circular bosses. These bosses are comprised of two types of fastener elements, a male element and a female element, of similar design but with a small difference in size, therewith enabling the male element to be pressed into the female element to produce a locking effect. When respective female and male elements are positioned mutually identically on the discrete pieces of material, the mutual positioning of the discrete pieces of material provided with the locking elements can be varied so as to adjust the fit of the article on the wearer in accordance with requirements. The aforesaid locking elements may be produced by vacuum-forming heated plastic film or by rolling plastic material between profiled rolls.

TECHNICAL PROBLEMS

[0003] One problem with the use of fastener means of the kind described above with reference to U.S. 5,269,776 resides in positioning the discrete pieces of material provided with locking elements correctly on the absorbent article in conjunction with its manufacture.

Furthermore, when donning an absorbent article or when adjusting its position on the wearer, there is a danger of displacing the discrete pieces of material provided with said locking elements laterally in a vertical and/or sideways direction, therewith impairing function and/or reducing comfort, for instance because the absorbent body is wrongly located, because the fastener means become located at vulnerable places, such as the iliac crests, or because the elastic cuts into the body, etc. Another problem encountered with this type of locking element is that pre-formed material from which the discrete pieces of material provided with pre-formed locking elements are obtained is often supplied and stored in the form of reels or stacks which require a large amount of space, because the locking elements extend at right angles to the normal plane of the ultimate discrete material pieces. In order to achieve an optimal function, the fastener means must be produced from a material which has a given rigidity or stiffness, which in turn enhances the risk of chafing and impaired comfort, among other drawbacks. Another problem with this type of fastener means is that powder, creams and the like are liable to adhere to the locking elements and reduce the friction engendered thereby, therewith impairing the locking ability of the coacting male and female elements.

[0004] When using fastener means that consist in mutually separate fastener elements, such as press studs for instance, another problem is that these elements must be attached to the absorbent article in a manner which will prevent a child loosening the elements and putting them into its mouth, with disastrous consequences. Small parts also make manufacture difficult.

SUMMARY OF THE INVENTION

[0005] The invention is based on the fact that if two units that are to be locked together will only fit with one another in one single way, it is impossible to mutually connect these units in a mutually incorrect position. However, this mutual position is of no interest when the locking elements used are wrongly positioned on the absorbent article.

[0006] The present invention provides a method of manufacturing absorbent articles provided with fastener means that include locking elements, characterized by delivering a first web of material to an absorbent article manufacturing machine; separating discrete pieces of material from the first web; applying the discrete material pieces to a second web of material, for instance a web of material which is to form an absorbent article casing sheet; and thereafter forming locking elements in the regions of the discrete material pieces. By using raw material, preferably thermoplastic raw material, from which discrete pieces of material provided with locking elements are then formed, either during or in immediately connection with the manufacture of the

absorbent article, the raw material can be supplied in the form of compact reel material.

[0007] According to a preferred embodiment the discrete material pieces is placed on the second web of material synchronously with remaining manufacturing steps, wherein the second material web may constitute liquid-impermeable material from which the absorbent article backing sheet is produced. The present invention thus solves the problem of correctly positioning the fastener means as a whole on absorbent articles, by producing the fastener means, or at least by applying said fastener means, on said articles synchronously with the manufacture of the absorbent article. In a variant a third web of material is applied to the discrete material pieces prior to forming the locking elements in the laminate regions thus formed. Furthermore, the placing of the locking elements within the discrete material pieces in the manufacture of the absorbent article takes place synchronously with the remaining steps of absorbent article manufacture by coordinating the production of the locking elements with the manufacture of remaining parts of the absorbent article, with the aid of air-permeable forms or moulds into which thermoplastic material, preferably heated thermoplastic material, is drawn by suction therewith forming both male elements and female elements at their intended places. In a further variant coordinating of the production of the locking elements with the manufacture of remaining parts of the absorbent article is made with the aid of a device that includes peg-like elements, preferably a gear wheel, and a coating device provided with apertures corresponding to the peg-like elements, the discrete material pieces passing between said devices in manufacture, wherewith the locking elements are formed as the peg-like elements press the material forming the locking elements into said apertures. The discrete material pieces are comprised of thermoplastic material, which is heated prior to forming the locking elements.

[0008] A further method of manufacturing absorbent articles provided with fastener means that include locking elements, is characterized by delivering to a web of absorbent article blanks male locking elements and female locking elements which have been formed in discrete pieces of material in a forming unit, preferably by vacuum-forming, from the material webs; thereafter separating the material pieces with locking elements formed therein and applying the discrete material pieces on one of the outer sheets of the absorbent article with the aid of an applicator unit on one of the webs of material that is to form one of the outer sheets of the absorbent articles, said application being effected synchronously with the remainder of the absorbent article manufacturing process.

[0009] A further method of manufacturing absorbent articles provided with fastener means that include locking elements, is characterized by using only one web of material to form the locking elements, wherein the discrete material pieces obtain an array of female elements

and an array of male elements; applying the discrete material pieces onto a web of material intended for the ultimate absorbent article, such that these material pieces will be divided in the manufacture of the finished absorbent articles, wherein each pair of locking elements in an array of locking elements will be mounted on two different ultimate absorbent articles. The placing of the material pieces provided with female locking elements and male locking elements respectively is made in such a way that said material pieces will be located in such mutual relationship as to enable each discrete material piece to be fastened selectively to at least two different adjacent discrete material pieces.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 illustrates a number of different exemplifying embodiments of the locking elements, as seen at right angles to the normal plane of the discrete piece of material.

Fig. 2 is a cross-sectional view of some of the embodiments shown in Fig. 1, rotated through 90° in relation thereto.

Fig. 3 is a schematic illustration of one method of producing an inventive fastener means.

Fig. 4 is a schematic illustration of an embodiment corresponding to the embodiment of Fig. 3, but where the material is provided with locking elements prior to being clipped into discrete pieces.

Fig. 5 illustrates schematically a variant of the embodiment shown in Fig. 4.

Fig. 6 illustrates schematically a preferred position of the discrete locking-element carrying pieces on the finished article.

Fig. 7 shows some examples of the configuration of the locking elements mounted on the discrete pieces of material.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Fig. 1 illustrates a number of preferred embodiments of single locking elements as seen at right angles to the perpendicular plane of the discrete piece of material. Of the locking elements shown, the element 31 has a elliptical shape, the element 32 has a rectangular shape, the element 33 has a square shape, the element 34 has a sunken elliptical configuration, which will be more easily understood with the aid of the element 41 shown in Fig. 2, where the element 34 is shown

in cross-section turned through 90°. The illustrated element 35 has the shape of a square combined with segments of a circle, and the element 36 has a circular shape. It will be understood, that the locking elements may have any one of an infinite number of shapes without departing from the concept of the invention that two similar elements having a small difference in size can be pressed together to achieve a locking effect, a so-called snap-effect. As before mentioned, the slightly smaller so-called male element is pressed into the so-called female element, wherein at least one of said elements consists in a material that has a given degree of elasticity.

[0012] The female and male elements need not have precisely the same form, but may have mutually different forms. Fig. 1 shows an example of a male element 42 which has recesses or notches 44 in its four corners. This male element 42 is intended to fit into a female element 43, shown by the side of the male element 42 in Fig. 1. The female element 43 lacks corresponding notches or recesses. Without limiting the invention to any precise theory, it is believed that the indented or recessed regions of the male element 42 can be deformed to facilitate insertion of the male element 42 in the female element 43.

[0013] Fig. 2 illustrates a number of preferred exemplifying locking elements in cross-section and from one side, i.e. seen in a direction which is turned through 90° in relation to the directions in Fig. 1. For instance, the element 41 illustrates the locking element 34 turned through 90°. The locking elements 37-40 are shown in cross-section in order to show the form which acts positively on the locking effect achieved with the locking elements. In the case of one preferred embodiment, the locking elements of the inventive fastener means are produced by sucking parts of discrete material pieces into air-permeable moulds, therewith to form cavities by vacuum-forming, wherewith the material need only be heated to improve its mouldability. When forming of the locking elements in accordance with the present invention is carried out in-line with the remainder of the absorbent article manufacturing process, positioning of the locking elements will be synchronized with the remainder of the article manufacturing process. This process will be explained in more detail below, with reference to a number of exemplifying embodiments.

[0014] Fig. 3 illustrates schematically a first preferred embodiment of a method of manufacturing absorbent articles provided with the preferred locking element. In this case, the outer layer 1 of the ultimate absorbent article is comprised of nonwoven material delivered to a mat-forming unit 2. Absorbent bodies 3 of preferably fibrous material are also placed on the layer 1 in the unit 2. The numeral 4 identifies the web of material in which the locking elements are to be formed, this web of material being delivered to a forming and applying device 6, where the discrete pieces of material 7 are produced. Also delivered to the device 6 is a material web 5 com-

prised preferably of liquid-impermeable plastic material which is to form the backing sheet of the absorbent article. The discrete material pieces 7 are applied to the web 5 in the device 6, preferably on that side of the web 5 which will ultimately be turned towards the layer 1, meaning that the discrete material pieces 7 will be located between the layer 1 and the web 5 in a finished preferred embodiment of an inventive absorbent article. The material web 5 and the discrete material pieces 7 are joined together with the layer 1 provided with absorbent bodies 3 in the joining and assembling station 8. The locking elements 10, 11 are then formed in the unit 9, wherein vacuum-forming is the technique preferably applied, in which both the male locking elements 11 and the female locking elements 10 are formed. These elements are given a configuration within the pieces 7 such that locking can only be effected in one specific way. Naturally, the described embodiment will also include the laying-out of elastic devices, the cutting-out of finished articles, etc., these manufacturing stages being purposely omitted both here and in the following embodiments, since a description of these manufacturing stages will not facilitate an understanding of the invention. It should be emphasized in connection with the description of the preferred embodiment that when the discrete material pieces 7 are placed between the layer 1 and the web 5, as in the case of the described embodiment, friction is increased and the locking effect between the locking elements 10 and 11 is enhanced due to the presence of the nonwoven material. Furthermore, the locking effect afforded by the locking elements is less vulnerable to the influence of powder, creams or fluids. The use of nonwoven material also enhances the softness of the absorbent article, and therewith also wearer comfort. Nonwoven material can also be used in the embodiments described below, to enhance the locking effect of said locking elements, this material either being in the form of completely covering layers, or in the form of pieces of material which cover only the locking elements or parts thereof.

[0015] Figure 4 illustrates schematically a second preferred embodiment of a method of producing absorbent articles provided with the preferred locking elements. In this case, the locking elements are formed separately in a vacuum-forming device 14 to which raw material is delivered in the form of strips made preferably of thermoplastic material 12, 13, these strips being delivered to a forming-and-applying module 15 after being vacuum-formed. The strips 12, 13 are brought to a desired form in the module 15, for instance by clipping the strips, whereafter the discrete material pieces 16, 17 are applied to the absorbent article during its manufacture. The discrete pieces 16, 17 are provided with male locking elements or female locking elements, which are thus applied externally to the laminate 19 consisting of surface material, preferably nonwoven material, and backing sheet material, preferably liquid-impermeable plastic material. In this stage of manufacture, the absorbent

bodies 18 and possibly also the elastic which is to be included in the finished absorbent articles have already been mounted on the absorbent articles under manufacture and are thus encapsulated in the laminate 19. After having applied the discrete pieces of material 16, 17 provided with locking elements, the absorbent articles under manufacture are transported to a finishing station and a packaging station.

[0016] The embodiments illustrated in Figs. 3 and 4 are intended for so-called transverse production, i.e. production in which the manufactured products are advanced through the manufacturing machine with their long sides extending transversely to their direction of movement through the machine. Naturally, the invention can just as well be applied in these embodiments for so-called lengthwise production, in which the long sides of the products extend in their direction of movement through the machine.

[0017] Fig. 5 illustrates a further preferred embodiment of the invention, similar to the embodiment illustrated in Fig. 4. The Figure shows an absorbent body 23 enclosed in a laminate 24 which is comprised of a liquid-permeable surface material which is intended to lie proximal to the wearer's skin in use, and a liquid-impermeable backing sheet. The raw material 20 from which the discrete pieces of material 26 are formed and in which the female locking elements 27 and the male locking elements 28 are to be formed, is delivered to a forming plant 21, preferably a vacuum-forming plant in which the different locking elements are formed. The now treated strip of material 22 is thereafter transported to a forming-and-applying station 25, in which the pieces of material 26 are shaped, e.g. by clipping, and applied to the laminate 24. In this stage of the manufacturing process, the discrete pieces of material 26 now applied to the laminate are provided with two separate arrays of locking elements 27 and 28 respectively. These material pieces 26 are separated in the subsequent working process, when the ultimate absorbent article is formed into separate products. In this regard, the separate ultimate absorbent articles may be alternately rotated through 180° prior to separation, which provides better use of the material among other things.

[0018] Fig. 6 illustrates preferred positioning of female locking elements 29 and male locking elements 30 on an absorbent article. The configuration of the locking elements on the discrete material pieces is such that each discrete piece of material can be locked onto at least the two adjacent discrete material pieces on the absorbent article. This locking element configuration enables a used article which has been rolled up to enclose its urine and faeces content to be fastened and sealed in a desired fashion. The locking elements on one and the same respective end part are disposed on opposite side surfaces of the article to the locking elements at the opposite respective end part.

[0019] Fig. 7 illustrates different element configurations for the fastener means 37-40, and different distri-

butions between male and female elements on the discrete material pieces. In Fig. 7, each fastener means is shown in two views, each rotated through 90° in relation to the other. For instance, the fastener means 37 includes a circular element and an elliptical element. The means 38 includes three circular locking elements in a configuration in which two elements form a close pair spaced from the third element. The fastener means 39 includes three locking elements, where one element is turned through 180° in relation to the other two elements. The fastener means 40 is a variant of the element configuration of the fastener means 38.

[0020] Different combinations of the aforesaid embodiments are conceivable. For instance, as before mentioned, the locking ability of all embodiments can be improved by applying nonwoven material or some other friction enhancing material on the male locking elements or in the female locking elements.

[0021] The invention can also be applied on pants which are intended to support absorbent diaper inserts.

[0022] It will be understood that the invention is not restricted to the aforescribed and illustrated exemplifying embodiments thereof and that the invention can be applied to other embodiments within the scope of the inventive concept.

Claims

1. A method of manufacturing absorbent articles provided with fastener means that include locking elements, characterized by delivering a first web of material (4) to an absorbent article manufacturing machine; separating discrete pieces of material (7) from the first web (4); applying the discrete material pieces (7) to a second web of material (5), for instance a web of material which is to form an absorbent article casing sheet; and thereafter forming locking elements in the regions of the discrete material pieces (7).
2. A method according to Claim 1, characterized by applying a third web of material (1) to the discrete material pieces (7) prior to forming the locking elements in the laminate regions thus formed.
3. A method according to Claim 1 or Claim 2, characterized by placing the discrete material pieces (7) on the second web of material (5) synchronously with remaining manufacturing steps, wherein the second material web (5) may constitute liquid-impermeable material from which the absorbent article backing sheet is produced.
4. A method according to Claims 1-3, characterized by placing the locking elements within the discrete material pieces in the manufacture of the absorbent article synchronously with the remaining steps of absorbent article manufacture.

5. A method according to Claims 1-4, **characterized** by coordinating the production of the locking elements with the manufacture of remaining parts of the absorbent article, with the aid of air-permeable forms or moulds into which thermoplastic material, preferably heated thermoplastic material, is drawn by suction therewith forming both male elements and female elements at their intended places. 5
6. A method according to Claims 1-4, **characterized** by coordinating production of the locking elements with the manufacture of remaining parts of the absorbent article, with the aid of a device that includes peg-like elements, preferably a gear wheel, and a coacting device provided with apertures corresponding to the peg-like elements, the discrete material pieces passing between said devices in manufacture, wherewith the locking elements are formed as the peg-like elements press the material forming the locking elements into said apertures. 10 15 20
7. A method according to Claim 6, **characterized** in that the discrete material pieces are comprised of thermoplastic material, which is heated prior to forming the locking elements. 25
8. A method of manufacturing absorbent articles provided with fastener means that include locking elements, **characterized** by delivering to a web of absorbent article blanks male locking elements (17) and female locking elements (16) which have been formed in discrete pieces of material in a forming unit (14), preferably by vacuum-forming, from the material webs (12, 13); thereafter separating the material pieces with locking elements formed therein and applying the discrete material pieces on one of the outer sheets of the absorbent article with the aid of an applicator unit (15) on one of the webs of material that is to form one of the outer sheets of the absorbent articles, said application being effected synchronously with the remainder of the absorbent article manufacturing process. 30 35 40
9. A method of manufacturing absorbent articles provided with fastener means that include locking elements, **characterized** by using only one web of material (22) to form the locking elements, wherein the discrete material pieces (26) obtain an array of female elements (27) and an array of male elements (28); applying the discrete material pieces (26) onto a web of material intended for the ultimate absorbent article, such that these material pieces (26) will be divided in the manufacture of the finished absorbent articles, wherein each pair of locking elements in an array of locking elements will be mounted on two different ultimate absorbent articles. 45 50 55
10. A method according to any one of Claims 1-9, **characterized** by placing the material pieces provided with female locking elements and male locking elements respectively in such a way that said material pieces will be located in such mutual relationship as to enable each discrete material piece to be fastened selectively to at least two different adjacent discrete material pieces.

Fig. 1

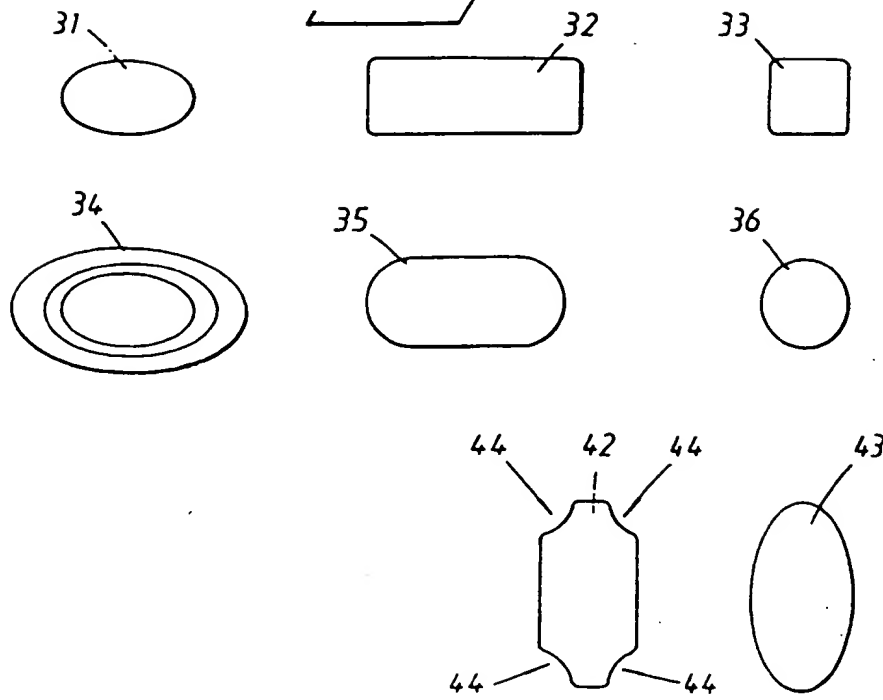


Fig. 2

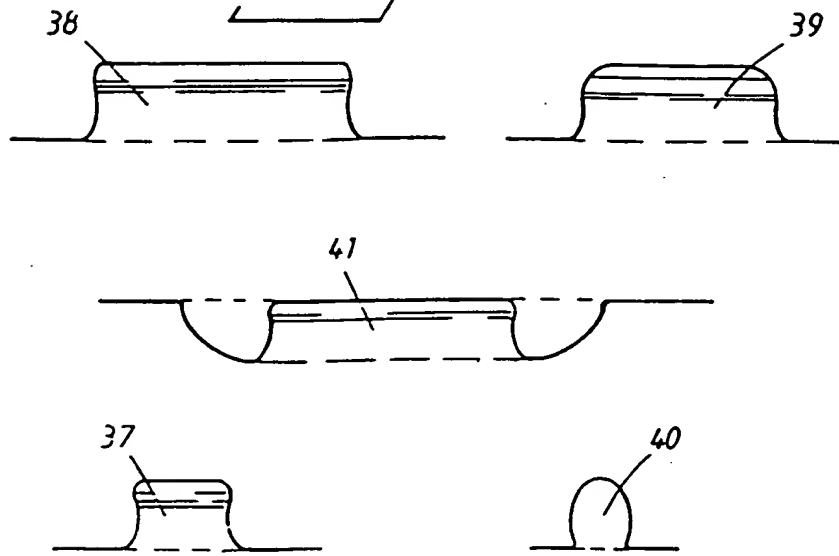


Fig. 3

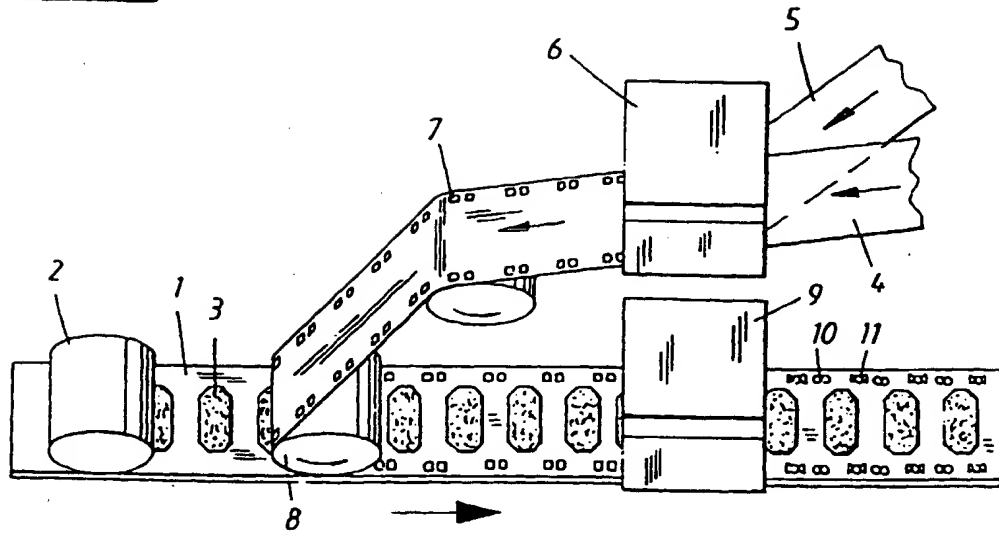


Fig. 4

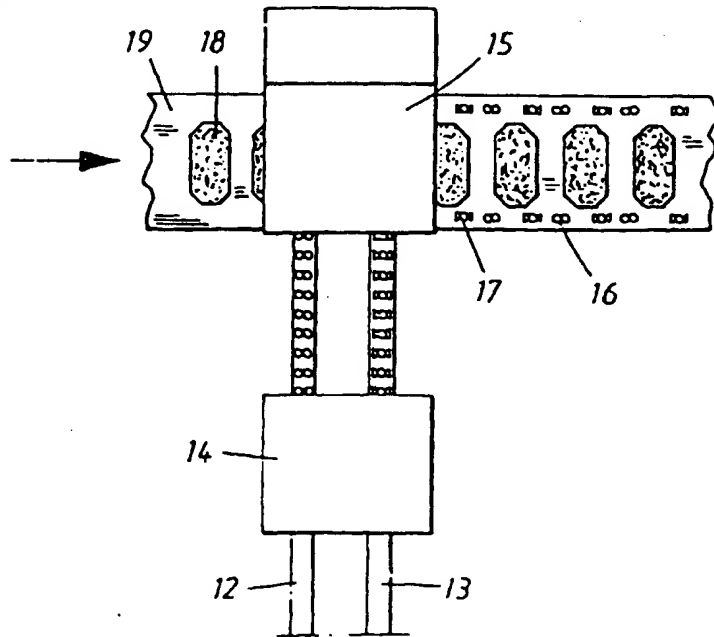


Fig. 5

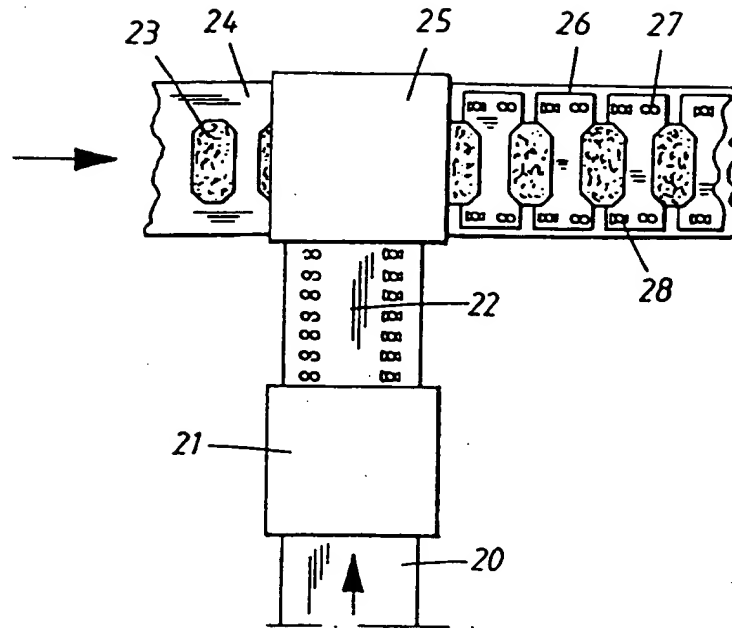


Fig. 6

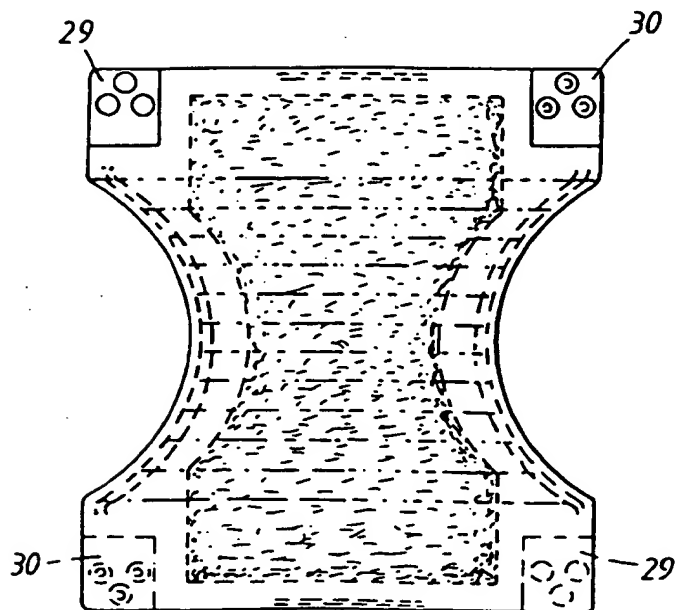


Fig. 7

